Requirements for Gas Quality SAT and Annual Maintenance Validation

ENA has developed and agreed a list of required site acceptance tests to allow biomethane sites to demonstrate their compliance to FWACV and GS(M)R regulation. Please note this is not a complete list of Site Acceptance Tests and a full list of tests should be developed based on manufacturer's recommendations for all equipment. The only requirements detailed below are with regards to meeting FWACV and GS(M)R regulatory compliance.

The requirements list below details a list of tests requiring completion as part of the Site Acceptance Test (SAT) and annual testing/validation of on-site equipment. Details of any Factory Acceptance Testing (FAT) can be provided, however all testing detailed below MUST be undertaken as part of the SAT.

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No.	Requirement	Test	Records	Why is this test required?
GS(M)R Analysers (rev 03/02/21)				
1	Validation the operation and Calibration / quality Assurance check of all online GS(M)R analysers as stipulated in the GQ/8 risk assessment (i.e. H2S, O2)	Verify the analysis system by running the system against a certified standard. Run a daily calibration or quality assurance check to verify operation against the system specific methodology. Check the alarm points of the system by simulating a failure state and subsequent actions.	1. Make, Model and Serial numbers of the GS(M)R analysers. 2. The Manufacturer's data sheet for each instrument 3. Performance Evaluation of each instrument 4. Certification of calibration standard used for test 5. Results and readings on supervisory system and RTU 6. System generated calibration data or quality assurance data 7. Alarm limits for calibration or quality assurance check 8. Quality Assurance check or auto calibration methodology Tolerances dependant upon technology in use, should be in line with manufacturers data sheets. Typically: H2S - 0.5ppm + Cal Standard Uncertainty (0.1ppm) - Limit 2.7ppm (4.05 mg/m3). O2 - 0.05% + Cal Standard uncertainty (0.05%) - Limit 0.9 mol%	Testing of the analysers is required to ensure regulatory compliance with GS(M)R. Please note; Evaluations are a separate validation test and is not part of SAT, it is a separate deliverable. Completing an ISO10723 does not remove the need to undertake these tests.

2	H2O - Water Dewpoint	Test instrument using a > 90% dry gas, and ensure response in within manufacturers specifications	1. Make, Model and Serial numbers of the analysers. 2. The manuf.s factory calibration for the site specific instrument 3. Certification of dry gas bottle used for the test 4. Results and readings on supervisory system and RTU 5. Confirmation from instrument manufacturer regarding response 6. Calibration methodology based on manuf.instructions 7. Failure modes for the sensors Tolerances dependant upon technology in use, should be in line with manufacturers data sheets.	
Ofgem GC - Bottle/Sample Pressures and Temperatures (rev 03/02/21)				
3	Pressure analogues	Undertake a minimum 3 point check, preferably a 5 point check of each bottle/sample pressure transmitter. For ease of testing 20barG can be used as the maximum figure where pressures exceed this pressure. Carry out the test using suitable pressure producing device. Results must taken from instrument through to Danview Screen.	Tabulate results to demonstrate the following results for each bottle/sample pressure transmitter using correct methodology 1. Rising and falling pressure applied to instrument 2. mA reading from output of instrument 3. Danview screen reading (F3) 4. Record Make, Model and Serial of test equipment used 5. Provide calibration certification for test equipment used. 6. Sensors must be validated annually. All instruments must be done individually.	Testing of the Ofgem GC bottle/sample pressure and temperature instruments is required to ensure compliance with The Gas Calculation of Thermal Energy Regulations and to ensure the equipment meets the associated Letter of Approval.
4	Temperature analogues	Undertake a 5 point check of each bottle/sample temperature transmitters. Carry out the test using suitable multicalibrator and apply a resistance to the transmitter. Results must taken from instrument through to Danview Screen.	Tabulate results to demonstrate the following results for each bottle/sample temperature analogue point using correct methodology 1. Temperature/Resistance applied at instrument 2. mA reading out of instrument (If transmitter) 3. Danview screen reading. 4. Record Make, Model and Serial of test equipment used 5. Provide calibration certification for test equipment used. All instruments must be done individually. 6. Spot check of temperature loop against calibrated temperature sensor. 7. Sensors must be validated annually.	
5	Pressure Alarms	Simulate pressure by applying mA using a suitable mutlicalibrator recording the alarm level as per the readings in Danview. Confirm system 1 alarm is generated.	Tabulate results to demonstrate readings for each bottle/sample Pressure alarm point using correct the methodology 1. Pressure simulated on instrument via injection of mA 2. Reduce pressure until alarm is raised - Record Danview reading 3. Increase pressure until alarm clears - Record Danview reading 3. Has system 1 alarm been generated? (Y/N) 4. Ensure alarm limits align with Letter of Approval 5. Supply ocgdata or xferData configuration file 6. Sensors must be validated annually All instruments must be done individually.	

6	Temperature Alarms	Simulate pressure by applying mA using a suitable mutlicalibrator recording the alarm level as per the readings in Danview. Confirm system 1 alarm is generated.	Tabulate results to demonstrate readings for each bottle/sample Pressure alarm point using correct the methodology below 1. Pressure simulated on instrument via injection of mA 2. Reduce pressure until alarm actuates - Record Danview reading 3. Increase pressure until alarm clears - Record Danview reading 3. Has system 1 alarm been generated? (Y/N) 4. Ensure alarm limits align with Letter of Approval 5. Supply ocgdata or xferData configuration file 6. Sensors must be validated annually. All instruments must be done individually.	
System 1 Alarm Checks (rev 03/02/21)				
7	Ofgem GC alarms	Move alarm limits in GC controller for 1 component, unormalised total, and CV to initiate System 1 alarm	Tabulate results to show system 1 alarm has been proven to show on the supervisory system and RTU 1. Name components tested 2. Record AF values 3. State the level the limit was adjusted to. 4. Return all limits to those outlined in the letter of approval 5. Record AL values 6. Provide PDF of final configuration	Testing of the Ofgem GC bottle/sample pressure and temperature instruments is required to ensure compliance with The (Gas) Calculation of Thermal Energy Regulations and to ensure the equipment meets the associated Letter of Approval.
8	Calibration Fail	Isolate calibration gas supply after the transmitter	Tabulate results to show system 1 alarm has been proven to show on the supervisory system and RTU 1. Verify Calibration fail is announced on Danview 2. Return all limits to those outlined in the letter of approval 3. Provide PDF of final configuration	
9	Loss of comms	Disconnect GC comms	Tabulate results to show system 1 alarm has been proven to show on the supervisory system and RTU. Record time delay.	
10	Stop Dango	Stop Dango/ Encalgo	Tabulate results to show system 1 alarm has been proven to show on the supervisory system and RTU	
Meter Suspect (rev 01/03/19)				
11	High level contributions to the meter suspect alarm	As per Guidance relating to the pass/fail criteria for an acceptance test of a FWACV metering system - A2 Contributions to the meter suspect alarm	This is to be done for all new Flow Computer configuration, falling outside of the agreed generic build. Initial testing is to be witnessed by the GDN and the flow computer configurations signed off. For existing flow computer configurations, the flow computer configuration with any changes highlighted should be submitted as part of the SAT.	Metering systems that contribute to the calculation of the flow weighted average calorific value of an LDZ are normally required to conform to the GDN's policies and specifications. The acceptance shall be granted only after satisfactory factory acceptance testing and calibrations, and provision of an agreed commissioning and validation procedure.

12	Contributions to the general alarm	As per Guidance relating to the pass/fail criteria for an acceptance test of a FWACV metering system - A2 Contributions to the meter suspect alarm	This is to be done for all new Flow Computer configuration, falling outside of the agreed generic build. Initial testing is to be witnessed by the GDN and the flow computer configurations signed off. For existing flow computer configurations, the flow computer configuration with any changes highlighted should be submitted as part of the SAT.	Metering systems that contribute to the calculation of the flow weighted average calorific value of an LDZ are normally required to conform to the GDN's policies and specifications. The acceptance shall be granted only after satisfactory factory acceptance testing and calibrations, and provision of an agreed commissioning and validation procedure.
13	Contributions to the meter N alarmed and in use alarm	As per Guidance relating to the pass/fail criteria for an acceptance test of a FWACV metering system - A2 Contributions to the meter suspect alarm	This is to be done for all new Flow Computer configuration, falling outside of the agreed generic build. Initial testing is to be witnessed by the GDN and the flow computer configurations signed off. For existing flow computer configurations, the flow computer configuration with any changes highlighted should be submitted as part of the SAT.	
14	Contributions to the meter N alarm	As per Guidance relating to the pass/fail criteria for an acceptance test of a FWACV metering system - A2 Contributions to the meter suspect alarm	This is to be done for all new Flow Computer configuration, falling outside of the agreed generic build. Initial testing is to be witnessed by the GDN and the flow computer configurations signed off. For existing flow computer configurations, the flow computer configuration with any changes highlighted should be submitted as part of the SAT.	
15	Contributions to the pulsed type meter specific alarms	As per Guidance relating to the pass/fail criteria for an acceptance test of a FWACV metering system - A2 Contributions to the meter suspect alarm	This is to be done for all new Flow Computer configuration, falling outside of the agreed generic build. Initial testing is to be witnessed by the GDN and the flow computer configurations signed off. For existing flow computer configurations, the flow computer configuration with any changes highlighted should be submitted as part of the SAT.	
16	Contributions to the serially connected meter specific alarms	As per Guidance relating to the pass/fail criteria for an acceptance test of a FWACV metering system - A2 Contributions to the meter suspect alarm	This is to be done for all new Flow Computer configuration, falling outside of the agreed generic build. Initial testing is to be witnessed by the GDN and the flow computer configurations signed off. For existing flow computer configurations, the flow computer configuration with any changes highlighted should be submitted as part of the SAT.	
17	Flow Computer points to Supervisory system.	Test flow signal from supervisory signal to Flow computer	This is to be done for all new Flow Computer configuration, falling outside of the agreed generic build. Initial testing is to be witnessed by the GDN and the flow computer configurations signed off. For existing flow computer configurations, the flow computer configuration with any changes highlighted should be submitted as part of the SAT.	
Odourisation (rev 03/02/21)				
18	Odourisation (LGT) Alarms	Test all alarms on LGT system according to manufacturers documentation.	Tabulate results to show the LGT System alarm has been proven to show on the supervisory system and RTU 1. Provide manufacturer's documentation regarding validation test requirements 2. Verify each component of the LGT fail alarm and record pass/fail status	Testing of the odourisation (LGT) system are required to ensure compliance with GS(M)R
19	Flow simulation	Simulate flow on the meter and record results on LGT system	Tabulate results to show the flow retransmission has been proven from flow computer to LGT controller 1. Simulate 0%, 50% and 100% flow from the flow computer outputs 2. Record results from the LGT controller	
20	Integrated count	Provide calculations to determine integrated count to DNCC.	Provide calculations 1. Integrated count frequency for the commissioning flow rate range based on an odorant injection rate of 6, 10 and 20mg. (pre G2G) 2. Integrated count frequency for the permanent flow rate range on an odorant injection rate of 6, 10 and 20mg. (BAU)	

Reject Mode checks (rev 03/02/21)				
21	Test all points that will immediately close the G2G valve - This does not require gas flow and can be simulated.	Test all points that will immediately close the G2G valve via supervisory system simulation	Nb. Test must be completed as the final test within the SAT verifying any changes. This test will also be witnessed by the GDN operations on the day of gas to grid. Tabulate results to show results of all points outlined within the control philosophy document. CV, Wobbe, Delivery pressure, Delivery Temp, Dewpoint, O2, H2S, H2, ICF, SI, N2, CO2, GQ system fail, Meter suspect, LGT system fail, Permissive flag, blending point (if applicable) These tests can be undertaken and simulated without supply of gas. i.e. All GC points can be checked by running calibration gas through the GC, other tests can be simulated through applying pressure or resistance to instruments or turning off equipment to simulate a failure.	To ensure the critical valve operations are tested and witnessed by the GDN operations. All excursion shall result in the gas to grid valve closing. Only upon failure of that system should the ROV be required to close.
Modbus Checks				
23	Test modbus addresses from instrument to Supervisory System and RTU	Change state on ALL instruments both analogue and digital and verify correct modbus addressing between instrument, supervisory system and RTU.	Nb. Test must be completed at the end of the SAT, to verify any changes. Tabulate results to show all modbus addressing 1. Individually open circuit all instruments 2. Record address changed 3. Validate value on supervisory system and RTU	Modbus checks are required to verify the communications between the systems and identify any mapping issues. Please note; E2E testing should validate a working system and not be used as part of any fault finding exercise
24	Test modbus addresses for all software generated points from source to Supervisory System and RTU	Change state on ALL instruments both analogue and digital and verify correct modbus addressing between instrument, supervisory system and RTU.	Nb. Test must be completed at the end of the SAT, to verify any changes. Tabulate results to show all modbus addressing 1. Individually change state of all software generated points 2. Record address changed 3. Validate value on supervisory system and RTU	